Arizona's FINAL 2004 303(d) List and Other Impaired Waters

At Least One Designated Use Assessed as "Impaired"

Surface Water Stream Reach or Lake Number		Pollutants or Parameters of Concern: 303(d) List TMDL required	Pollutants or Parameters of Concern: TMDL completed or not required (4a = TMDLs complete but water quality remains impaired; 4b = no TMDL required, water is impaired but expected to attain standards by next list)
Bill Williams Watershed			
Alamo Lake AZL15030204-0040		Mercury in fish tissue, pH (high), ammonia	
Coors Lake AZL15030204-5000		Mercury in fish tissue	
Boulder Creek unnamed tributary - Wilder Creek AZ15030202-006B		Mercury	
Boulder Creek Wilder Creek – Copper Creek AZ15030202-005A	Wilder Creek – Butte Creek	Mercury	4a Arsenic, copper, zinc
	Butte Creek – Copper Creek		4a Arsenic
Burro Creek Boulder Creek - Black Canyon AZ15030202-004		Mercury	
Colorado – Grand Canyon Watershed			
Colorado River Parashant Canyon - Diamond Creek AZ15010002-003		Selenium, suspended sediment concentration	
Paria River Utah border - Colorado River AZ14070007-123		Suspended sediment concentration	
Virgin River Beaver Dam Wash - Big Bend Wash AZ15010010-003		Selenium, suspended sediment concentration	
Colorado – Lower Gila Watershed			
Colorado River Hoover Dam - Lake Mohave AZ15030101-015		Selenium	
Gila River Coyote Wash - Fortuna Wash AZ15070201-003		Boron, selenium	
Painted Rock Borrow Pit Lake AZL15070201-1010		DDT metabolites, toxaphene and chlordane in fish tissue, dissolved oxygen	
Little Colorado – San Juan Watershed			
Bear Canyon Lake AZL15020008-0130		pH	
Lake Mary (lower) AZL15020015-0890		Mercury in fish tissue	
Lake Mary (upper) AZL15020015-0900		Mercury in fish tissue	
Little Colorado River West Fork of the Little Colorado River - Water Canyon Creek AZ15020001-011			4a Turbidity/suspended sediment concentration
Little Colorado River Water Canyon Creek - Nutrioso Creek AZ15020001-010			4a Turbidity/suspended sediment concentration
Little Colorado River Nutrioso Creek - Camero Wash AZ15020001-009			4a Turbidity/suspended sediment concentration
Little Colorado River unnamed reach (15020001-021) to Lyman Lake AZ15020001-005			4a Turbidity/suspended sediment concentration
Little Colorado River Silver Creek - Carr Wash AZ15020002-004		*Escherichia coli*, sediment	

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Little Colorado River Porter Tank Draw - McDonalds Wash AZ15020008-017	Copper, silver, suspended sediment concentration	
Long Lake AZL15020008-0820	Mercury in fish tissue	
Lyman Lake AZL15020001-0850	Mercury in fish tissue	
Nutrioso Creek headwaters - Picnic Creek AZ15020001-017		4a Turbidity/suspended sediment concentration
Nutrioso Creek Picnic Creek - Little Colorado River AZ15020001-015		4a Turbidity/suspended sediment concentration
Rainbow Lake AZL15020005-1170		4a Nutrients and pH
Soldiers Lake AZL15020008-1440	Mercury in fish tissue	
Soldiers Annex Lake AZL15020008-1430	Mercury in fish tissue	
Middle Gila Watershed		
Alvord Park Lake AZL15060106B-0050	Ammonia	
Cash Mine Creek headwaters - Hassayampa River AZ15070103-349		4a Copper, zinc
Cash Mine Creek (unnamed tributary to) headwaters - Cash Mine Creek AZ15070103-415		4a Cadmium, copper, zinc
Chaparral Lake AZL15060106B-0300	Dissolved oxygen, *Escherichia coli*	
Cortez Park Lake AZL15060108B-0410	Dissolved oxygen, pH (high)	
French Gulch headwaters - Hassayampa River AZ15070103-239	Copper, zinc, cadmium	
Gila River Salt River - Agua Fria River AZ15070101-015	DDT metabolites, toxaphene and chlordane in fish tissue	
Gila River Agua Fria River - Waterman Wash AZ15070101-014	DDT metabolites, toxaphene and chlordane in fish tissue	
Gila River Waterman Wash - Hassayampa River AZ15070101-010	DDT metabolites, toxaphene and chlordane in fish tissue	
Gila River Hassayampa River - Centennial Wash AZ15070101-009	DDT metabolites, toxaphene and chlordane in fish tissue	
Gila River Centennial Wash - Gillespie Dam AZ15070101-008	DDT metabolites, toxaphene, and chlordane in fish tissue, boron, selenium	
Gila River Gillespie Dam - Rainbow Wash AZ15070101-007	DDT metabolites, toxaphene and chlordane in fish tissue	
Gila River Rainbow Wash - Sand Tank AZ15070101-005	DDT metabolites, toxaphene and chlordane in fish tissue	
Gila River Sand Tank - Painted Rocks Reservoir AZ15070101-001	DDT metabolites, toxaphene and chlordane in fish tissue	
Hassayampa River headwaters - Copper Creek AZ15070103-007A		4a Cadmium, copper, zinc, and pH
Hassayampa River Buckeye Canal - Gila River AZ15070103-001B	DDT metabolites, toxaphene and chlordane in fish tissue	

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Mineral Creek Devils Canyon - Gila River AZ15050100-012B	Copper, selenium	
Painted Rocks Reservoir AZL15070101-1020A	DDT metabolites, toxaphene and chlordane in fish tissue	
Queen Creek headwaters - Superior Mine WWTP AZ15050100-014A	Copper	
Queen Creek Superior Mine WWTP - Potts Canyon AZ15050100-014B	Copper	
Salt River 23rd Ave WWTP - Gila River AZ15060106B-001D	DDT metabolites, toxaphene and chlordane in fish tissue	
Turkey Creek unnamed tributary at 34°19'28"/112°2128 - Poland Creek AZ15070102-036B	Cadmium, copper, zinc, lead	
Salt River Watershed		
Canyon Lake AZL15060106A-0250	Dissolved oxygen	
Christopher Creek headwaters - Tonto Creek AZ15060105-353		4a *Escherichia coli*
Crescent Lake AZL15060101-0420	pH (high)	
Gibson Mine tributary headwaters - Pinto Creek AZ15060103-887		4a Copper
Pinto Creek headwaters - tributary at 33°19'27"/110°54'56" AZ15060103-018A		4a Copper
Pinto Creek tributary at 33°19'27"/110°54'56" - Ripper Spring AZ15060103-018B		4a Copper
Pinto Creek Ripper Spring - Roosevelt Lake AZ15060103-018C	Selenium, copper	
Salt River Stewart Mountain Dam - Verde River AZ15060106A-003	Dissolved oxygen, copper	
Tonto Creek headwaters - unnamed trib at 34°18'10" / 111° 04'14" AZ15060105-013A	Dissolved oxygen, nitrogen	4a *Escherichia coli*
Tonto Creek unnamed trib at 34°18'10" / 111° 04'14" - Haigler Creek AZ15060105-013B	Nitrogen	4a *Escherichia coli*
San Pedro – Willcox Playa – Rio Yaqui Watershed		
Brewery Gulch headwaters - Mule Gulch AZ15080301-337	Copper	
Mule Gulch headwaters - above Lavender Pit AZ15080301-090A	Copper	
Mule Gulch above Lavender Pit - Bisbee WWTP AZ15080301-090B	Copper, pH (low)	
Mule Gulch Bisbee WWTP - Highway 80 Bridge AZ15080301-090C	Copper, zinc, pH (low), cadmium	
San Pedro River Mexico border - Charleston AZ15050202-008	Copper	

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San Pedro River Babocomari Creek - Dragoon Wash AZ15050202-003	*Escherichia coli*	
San Pedro River Dragoon Wash - Tres Alamos Wash AZ15050202-002	Nitrate	
San Pedro River Aravaipa Creek - Gila River AZ15050203-001	*Escherichia coli*, selenium	
Santa Cruz – Rio Magdalena – Rio Sonoyta Watershed		
Alum Gulch headwaters - 31°28'20"/110°43'51" AZ15050301-561A		4a Cadmium, copper, pH (low), zinc
Alum Gulch 31°28'20"/110°43'51" - 31°29'17"/110°44'25" AZ15050301-561B		4a Cadmium, copper, pH (low), zinc
Arivaca Lake AZL15050304-0080		4a Mercury in fish tissue
Cox Gulch headwaters - 3R Canyon AZ15050301-560		4a Cadmium, copper, zinc, and pH (low)
Cox Gulch, (unnamed tributary of) headwaters - Cox Gulch AZ15050301-877		4a Cadmium, copper, zinc, and pH (low)
Harshaw Creek headwaters - Sonoita Creek AZ15050301-025		4a Copper and pH (low)
Harshaw Creek, (unnamed tributary of) (Endless Chain Mine tributary) headwaters - Harshaw Creek AZ15050301-888		4a Copper and pH (low)
Humbolt Canyon headwaters - Alum Gulch AZ15050301-340		4a Cadmium, copper, zinc, and pH (low)
Lakeside Lake AZL15050302-0760	Dissolved oxygen, ammonia, nitrogen, phosphorus, chlorophyll	
Nogales and East Nogales washes Mexico border - Potrero Creek AZ15050301-011	Chlorine, *Escherichia coli*, ammonia, copper	
Parker Canyon Lake AZL15050301-1040	Mercury in fish tissue	
Pena Blanca Lake AZL15050301-1070		4a Mercury in fish tissue
Rose Canyon Lake AZL15050302-1260	pH	
Santa Cruz River Mexico border - Nogales WWTP AZ15050301-010	*Escherichia coli*	
Sonoita Creek 750 feet below WWTP - Santa Cruz River AZ15050301-013C	Zinc	4b Dissolved oxygen
Three R Canyon headwaters - 31°28'35"/110°46'19" AZ15050301-558A		4a Cadmium, copper, zinc, and pH (low)
Three R Canyon 31°28'35"/110°46'19"-31°28'27"/110°47'12" AZ15050301-558B		4a Cadmium, copper, zinc, and pH (low)
Three R Canyon 31°28'27"/110°47'12" - Sonoita Creek AZ15050301-558C		4a Copper and pH (low)
Three R Canyon, (unnamed tributary of) headwaters - Three R Canyon AZ15050301-889		4a Cadmium, copper, zinc, and pH (low)
Upper Gila Watershed		

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Cave Creek headwaters - South Fork of Cave Creek AZ15040006-852A	Selenium	
Gila River Skully Creek - San Francisco River AZ15040002-001	Selenium	
Gila River Bonita Creek - Yuma Wash AZ15040005-022	*Escherichia coli*, sediment	
Luna Lake AZL15040004-0840		4a Dissolved oxygen, pH (high), and a fish kill in 1999 (addressed through nutrient TMDL)
San Francisco River headwaters - New Mexico border AZ15040004-023	Sediment	
Verde River Watershed		
East Verde River Ellison Creek - American Gulch AZ15060203-022B	Selenium	
Grande Wash headwaters - Ashbrook Wash AZ15060203-991		4b *Escherichia coli*
Granite Creek headwaters - Willow Creek AZ15060202-059A	Dissolved oxygen	
Oak Creek At Slide Rock State Park AZ15060202-018B		4a *Escherichia coli*
Pecks Lake AZL15060202-1060		4a Dissolved oxygen (addressed through nutrient TMDL)
Stoneman Lake AZL15060202-1490		4a pH (high) (addressed through nutrient TMDL)
Verde River Oak Creek - Beaver Creek AZ15060202-015		4a Turbidity/suspended sediment concentration
Verde River Beaver Creek - HUC boundary 15060203 AZ15060202-001		4a Turbidity/suspended sediment concentration
Verde River West Clear Creek - Fossil Creek AZ15060203-025		4a Turbidity/suspended sediment concentration
Verde River Bartlett Dam - Camp Creek AZ15060203-004	Selenium, copper	
Watson Lake AZL15060202-1590	Nitrogen, dissolved oxygen, pH	
Whitehorse Lake AZL15060202-1630	Dissolved oxygen	

Memo to file by Peter Kozelka, EPA Region 9 Water Division for ADEQ 2004 303(d) list submittal

Date: Nov. 10, 2004

Topic: Evaluation of SSC & Turbidity data from ADEQ and assessment procedures for bottom deposits narrative

At my request, ADEQ provided available monitoring data for evaluating suspended sediment concentrations (SSC) and turbidity to facilitate assessments of stream and lake condition based on narrative standard for bottom deposits.

ADEQ had paired data for SSC and turbidity from three rivers with Aquatic and Wildlife warmwater (A&Wwarm) designated beneficial use, Verde, Salt and Upper Gila. I plotted turbidity vs SSC and evaluated the correlation via several ways. By using log-log transformations of the raw data, a procedure consistent with other sediment researchers, the correlation showed a good fit ($r^2 = 0.848$). The best fit line was equation was $y = 0.7414x + 0.8618$ and was not forced through zero, again consistent with other researchers (Lewis, 2002). I used this equation to convert the existing numeric SSC standard of 80 mg/L to a corresponding turbidity value of 25 NTU.

ADEQ's has two existing standards for assessing water quality conditions—the SSC numeric and the bottom deposits narrative. In 2002, ADEQ introduced the SSC numeric std. and they concurrently repealed the numeric turbidity standard(s). Whereas the turbidity std. criteria applied without consideration of stream flow rates, the SSC std. applies only during "baseflow" conditions (no further interpretation of baseflow exists in the standard). For the 2004 listing assessment, ADEQ had minimal SSC monitoring data for stream and rivers in Arizona. Staff did complete SSC assessments for approximately 10 rivers and concluded that three were impaired due to exceedences of this numeric standard. ADEQ did evaluate available turbidity data but concluded each water body was inconclusive, based on the fact that turbidity std. no longer applied. ADEQ did not make any assessments based on bottom deposits because state statute precludes them from using narrative standards until implementation has been completed. As of this date, ADEQ has not finalized nor adopted any narrative standard implementation measures.

EPA determined it appropriate to interpret the narrative bottom deposits standard by utilizing the correlation between SSC and turbidity described above. Thus turbidity was a surrogate for evaluating suspended sediment levels and associated bottom deposits. I increased the turbidity value above by a factor of two to accommodate some uncertainty in the correlation; **this yielded a turbidity guideline of 50 NTU to perform assessments of warm water streams/rivers**. This value is consistent with EPA's Gold Book (1986 and references therein) turbidity criteria as well as ADEQ's previously existing numeric turbidity standard for such waterbodies.

ADEQ did not have paired SSC and turbidity data for coldwater streams. However, other researchers have demonstrated this correlation does apply to coldwater streams in other states (Lewis, 2002). So I utilized ADEQ's previous turbidity standard of **10 NTU to perform assessments of coldwater streams**.

Again ADEQ did not have any paired data for turbidity and SSC for lakes. I recognize there may be additional uncertainty so I adjusted the State's previous numeric turbidity criteria three fold and utilized **30 for coldwater and 75 NTU to perform assessments of other lakes**.

For 24 waterbodies, I performed a case-by-case analysis of available monitoring data and other information. I considered the following information:

a. dates associated with turbidity data?
b. sample sizes exist for each waterbody?
c. frequency of exceedences above EPA turbidity guideline values?
d. magnitude(s) of excursions above the turbidity guideline values?
e. Median exceedences value in comparison to the turbidity guideline value.
f. If stream flow records were available, did any turbidity exceedences occur during lower flows as well as high flows?
g. If any SSC data were available, were there any excursions of that numeric value?
h. Any other sediment information available? Such as % fines (<0.062 mm) in the suspended sediment matter.
i. Was the waterbody segment adjacent to another segment that had been deemed impaired or where TMDL had been completed?
j. Had any major land use changes occurred recently in the watershed for each waterbody?
k. Any information pertaining to federally protected species (threatened and endangered) in the water body?

Waterbody	Criteria	Summary of results	Other info	Biological info
Billy Creek	10 NTU	Results range: 4 – 28 NTU **4 of 8 exceedences** (50%) magnitude of median exceedence value (15 NTU) is less than 2 fold higher than criteria maximum exceedence is 3 fold higher	Flow records show maximum exceedence occurred at higher streamflow rate.	
Chevelon Crk	10 NTU	Results range: 12 – 34 NTU **4 of 4 exceedences** (100%) magnitude of median exceedence value (14 NTU) is less than 2 fold higher than criteria; maximum exceedences is 3 fold higher	Flow records show maximum exceedence occurred at typical streamflow rate.	
LCR -- Silver Ck added	10 NTU	Results range: 54 – 1000 NTU **8 of 8 exceedences** (100%) magnitude of median exceedence value (115 NTU) is much greater than 2 fold higher than criteria;	Maximum exceedence occurred at highest streamflow rates; some mid-range exceedences at low flow rates; 1 of 1 SSC sample exceedence	Threatened & Endangered fish (spinedace and humpback chub) species present
Mineral Creek	50 NTU	Results range: 0.5 – 960 NTU **5 of 41 exceedences** (12%) magnitude of median exceedence value (90 NTU) is nearly 2 fold higher than criteria	All exceedences associated with higher streamflow rates. This data from sites above treatment area, so treatment will not benefit this upstream portion	Threatened Apache Trout present in this reach
Christopher	10 NTU	Results range: 1 - 89 NTU **8 of 19 exceedences** (42%) magnitude of median exceedence value (13 NTU) is less than 2 fold higher than criteria	Maximum exceedences occurred at higher streamflow rate. pre-1998 data shows 7 of 9 exceedences	
Tonto-hdwtr	10 NTU	Results range: 1 - 250 NTU **20 of 32 exceedences** (25%) magnitude of median exceedence value (25 NTU) is more than 2 fold higher than criteria; 3 exceedences are nearly 20fold higher than criteria	5 exceedences associated with lower streamflow rates	
Tonto—above Haigler Ck	50 NTU	Results range: 2.4 – 898 NTU **6 of 22 exceedences** (27%) magnitude of median exceedence value (99 NTU) is 2 fold higher than criteria	Maximum exceedences associated with lower streamflow rate	
Nogales Wash	50 NTU	Results range: 2 – 2730 NTU	maximum exceedences	Endangered fish (Gila

Waterbody	Criteria	Summary of results	Other info	Biological info
Border—Potrero		**5 of 18 exceedences** (28%) magnitude of median exceedence value (80 NTU) is less than 2 fold higher than criteria	occurred during higher streamflow rate	topminnow) species present
Santa Cruz—Josephine Cyn	50 NTU	Results range: 9 – 150 NTU **4 of 19 exceedences** (21%) magnitude of median exceedence value (78 NTU) is less than 2 fold higher than criteria	Effluent dependent waterbody; pre-1998 data shows 4 of 32 exceedences	Endangered fish (Gila topminnow) species present
Gila River-- SF River to Eagle	50 NTU	Results range: 10 – 701 NTU **8 of 10 exceedences** (80%) magnitude of median exceedence (172 NTU) is more than 2 fold higher than criteria	1997 data only	
Gila River-- Eagle to Bonita	50 NTU	Results range: 12 – 413 NTU **8 of 10 exceedences** (80%) magnitude of median exceedence (188 NTU) is more than 2 fold higher than criteria	1997 data only	
Gila River-- Bonita to Yuma added	50 NTU	Results range: 0.3 - 10,000 NTU **7 of 24 exceedences** (29%) magnitude of median exceedence value (420 NTU) is much higher than 2 fold higher than criteria; 3 exceedences more than 10fold higher than criteria	Some higher turbidity exceedences associated with lower streamflow rates; SSC data shows 1 annual mean and 4 event exceedences of 80 mg/L std.; 7 of 7 sediment samples show 100% fines (<.062 mm)	Threatened & Endangered fish (spikedace, loach minnow, razorback sucker) present
SF River-hdwtr-NM border added	10 NTU	Results range: 5 – 26 NTU **6 of 9 exceedences** (67%) magnitude of median exceedence value (21 NTU) is 2 fold higher than criteria	Some higher exceedences associated with lower streamflow rates	Threatened & Endangered fish (loach minnow & razorback sucker) present
SF River-Blue -Limestone	50 NTU	Results range: 2 – 999 NTU **3 of 16 exceedences** (19%) magnitude of median exceedence value (291 NTU) is more than 2 fold higher than criteria;	one exceedences associated with lower streamflow rates	Threatened & Endangered fish (loach minnow & razorback sucker) present
SF River-Limestone - Gila	50 NTU	Results range: 1 – 999 NTU **4 of 21 exceedences** (19%) magnitude of median exceedence value (132 NTU) is more than 2 fold higher than criteria; maximum result in 2002	Some exceedences associated with lower streamflow rates	
Beaver—Dry to Verde	50 NTU	Results range: 2 – 290 NTU **5 of 21 exceedences** (19%) magnitude of median exceedence value (190 NTU) is more	Only 1999 data , no newer data	

Waterbody	Criteria	Summary of results	Other info	Biological info
		than 2 fold higher than criteria;		
East Verde River—Ellison Ck	50 NTU	Results range: 2 – 1000 NTU **3 of 16 exceedences** (19%) magnitude of median exceedence value (120 NTU) is more than 2 fold higher than criteria;	2 exceedences occurred in 1999; both associated with higher streamflow rates	Endangered Gila trout present in segment immediately upstream
Verde – West Ck –Fossil Ck	50 NTU	Results range: 0.2 – 998 NTU **6 of 17 exceedences** (35%) magnitude of median exceedence value (135 NTU) is more than 2 fold higher than criteria;	Sediment TMDL approved in 2002 for segment immediately upstream	
Verde – Tangle – Ister Flat	50 NTU	Results range: 0.3 – 170 NTU **4 of 24 exceedences** (17%) magnitude of median exceedence value (76 NTU) is less than 2 fold higher than criteria	SSC data shows 5 of 23 sample exceedences of std.; (geomean = 31 mg/L)	
Ashurst Lake	10 NTU A&W cold	Results range: 114 – 120 NTU **4 of 4 exceedences** (100%) magnitude of median exceedence value (115 NTU) is more than 3 fold higher than criteria; magnitude of all exceedences 4 to 5 fold higher than criteria		
Kinnicknick Lake	10 NTU A&W cold	Results range: 60 – 71 NTU **7 of 7 exceedences** (100%) magnitude of median exceedence value (67 NTU) is more than 3 fold higher than criteria;		
Roosevelt Lake	25 NTU	Results range: 2 – 79 NTU **13 of 38 exceedences** (34%) magnitude of median exceedence value (36 NTU) is less than 3 fold higher than criteria;		
Horseshoe Reservoir	25 NTU	Results range: 1 – 90 NTU **4 of 18 exceedences** (22%) magnitude of median exceedence value (31 NTU) is less than 3 fold higher than criteria;		
Whitehorse Lake	10 NTU A&W cold	Results range: 23 – 46 NTU **8 of 9 exceedences** (89%) magnitude of median exceedence value (34 NTU) is 3 fold higher than criteria;		